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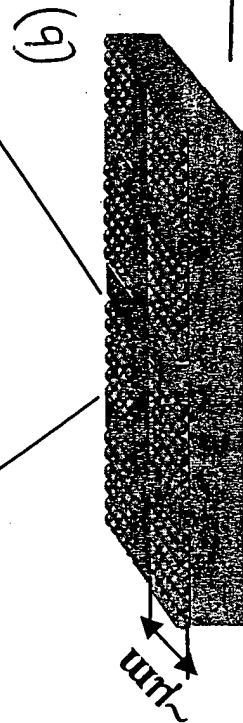
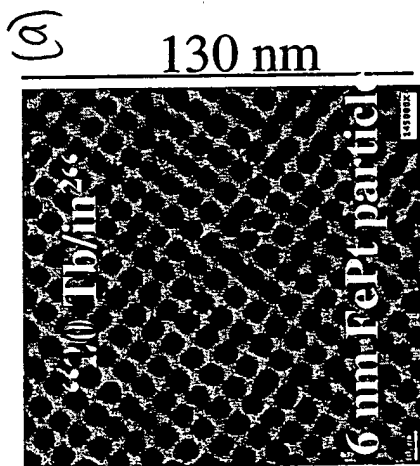
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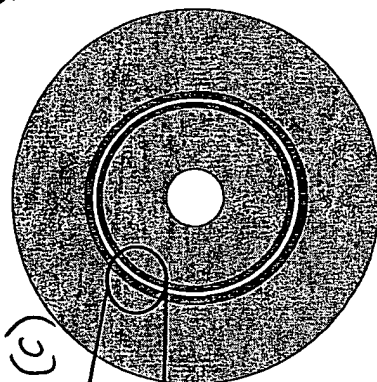
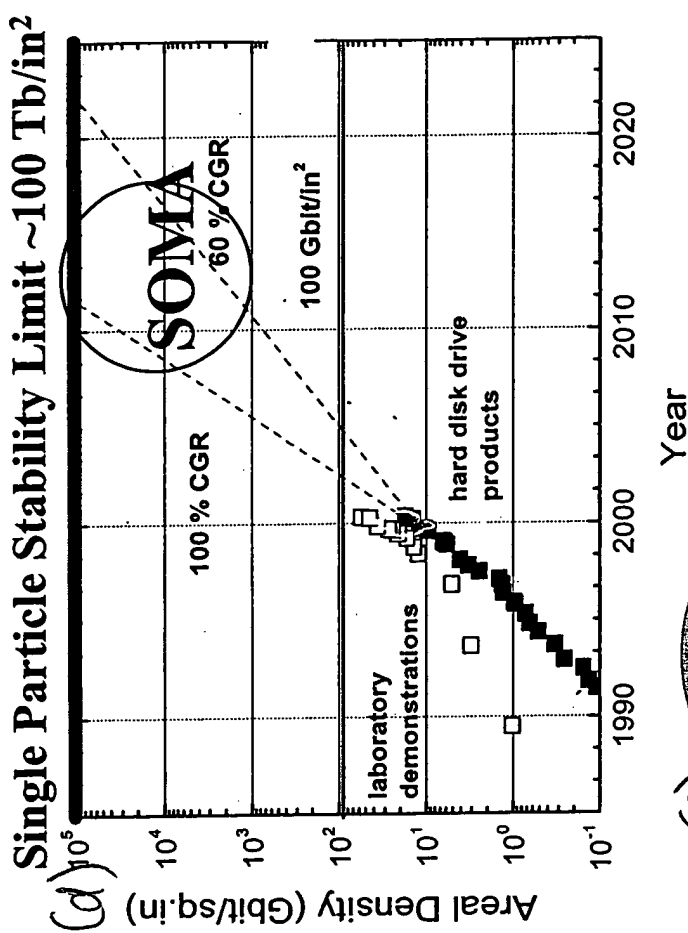
Figure 2

Self Ordered Magnetic Array (SOMA) Patterned Media

Naturally Patterned SOMA Structure
(nm scale)

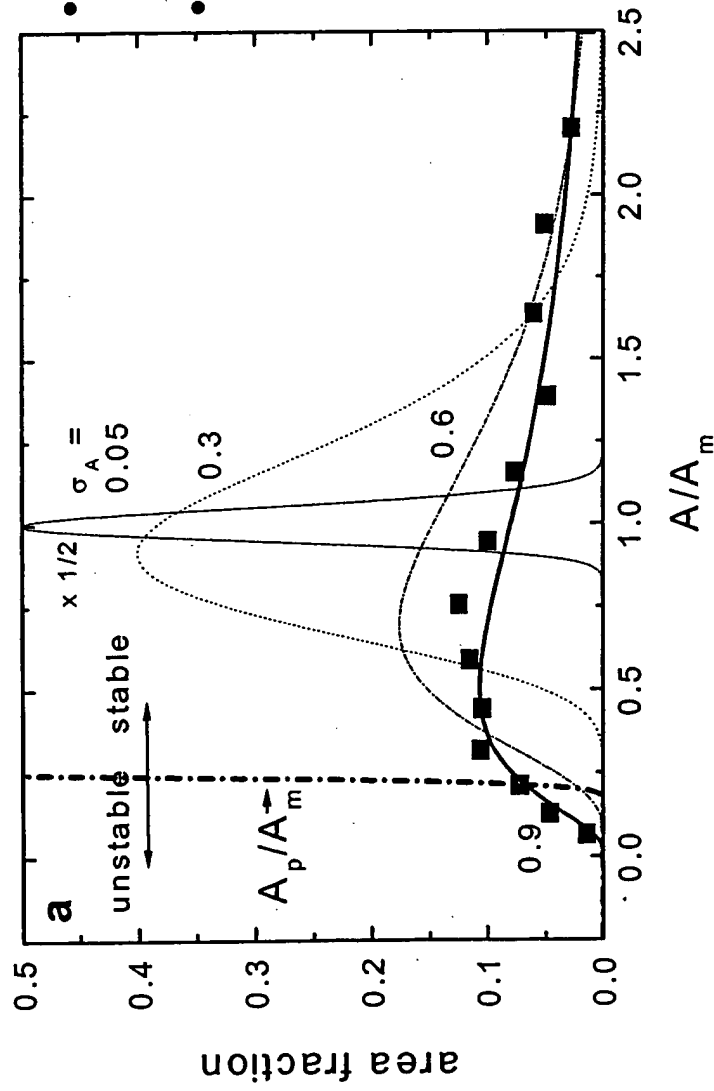


Lithographically Patterned Disk
(μm scale)



SOMA Disk

Potential Density Gain



•SNR gain by trimming σ

•SNR gain by reducing A

D. Weller and M. Doerner, Annu. Rev. Mat. Sci 2000, 30: 611-644

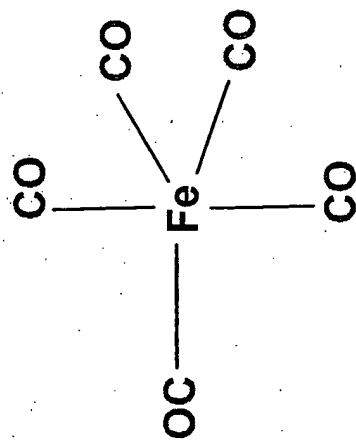
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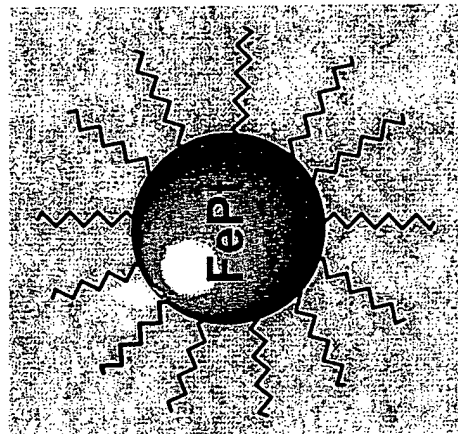


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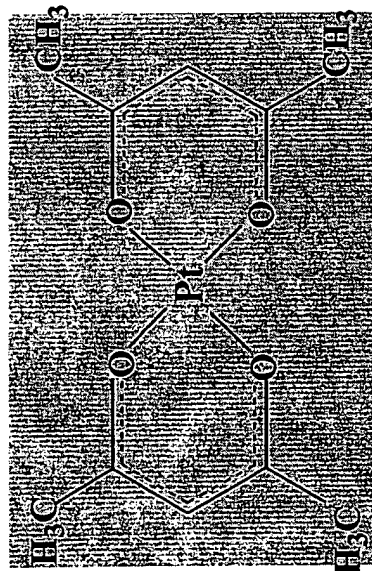
Synthesis



Heat, - CO



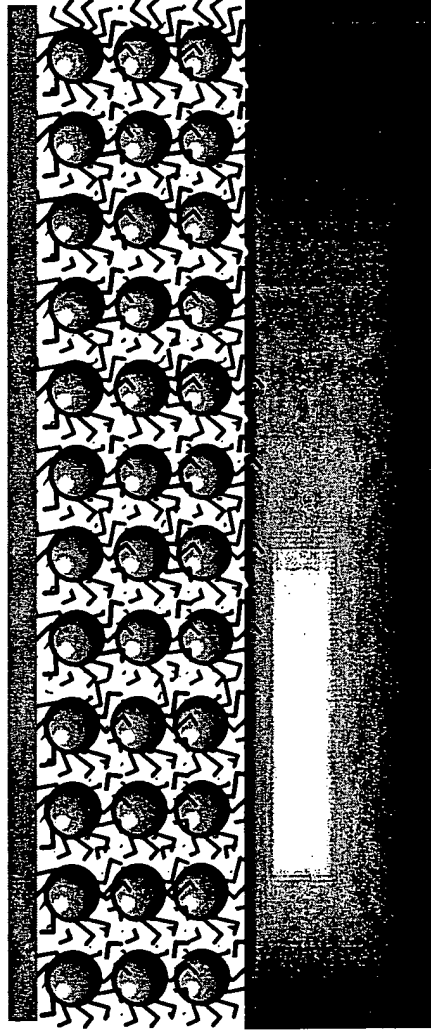
reduction



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Chemically Synthesized Nanoparticle Arrays

4 nm FePt particles



S. Sun et al., Science 287, 1989 (2000)

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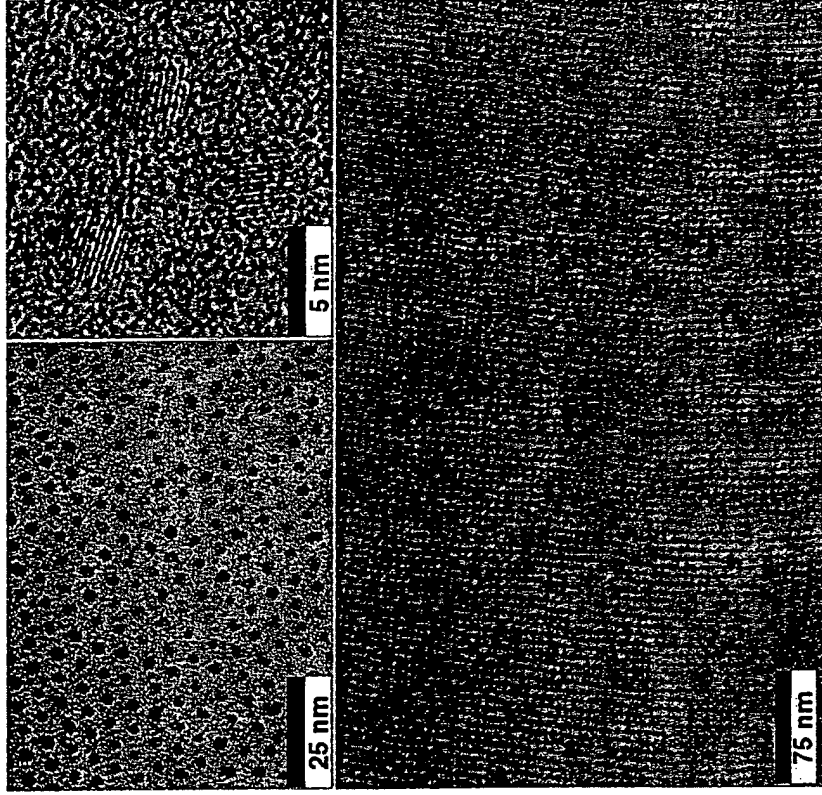
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Seagate Research

Chemically Synthesized Nanoparticle Arrays



4 nm $\text{Fe}_{52}\text{Pt}_{48}$

$\xi \sim 100 - 1000 \text{ nm}$

coherence length

S. Sun et al., Science 287, 1989 (2000)

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Critical Issues / Challenges

FABRICATION - PROPERTY CONTROL

- Nanoparticle Fabrication
- Control of Size - Property Distribution / Uniformity
- Control of Interparticle Interactions
- Deposition on Flat Smooth Surface - Roughness Control
- Control of Magnetization Dispersion - Texturing
- Control of Large Scale Ordering

RECORDING

- Writeability (Write Coercivity Constraint)
- Addressability (rotating disk vs xy stage)
- SNR requirements (read back sensor, noise)
- Magnetic Interactions (demagnetization)
- Stability

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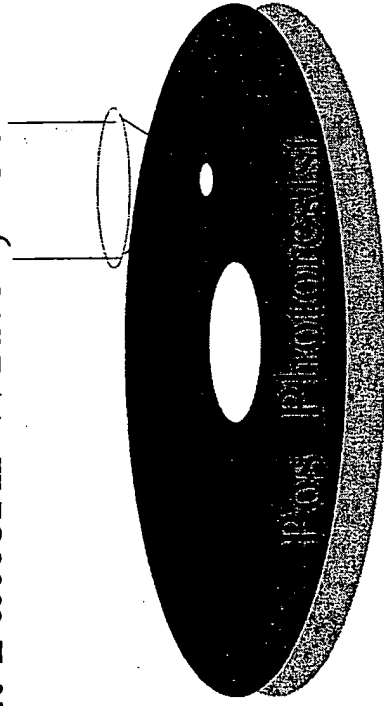
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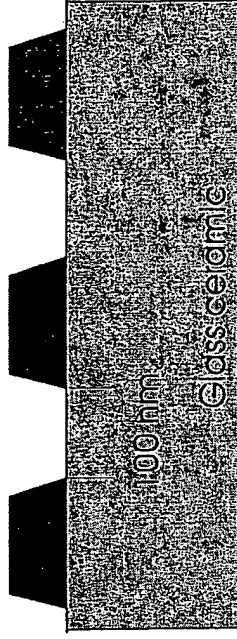
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SOMA Seagate Approach

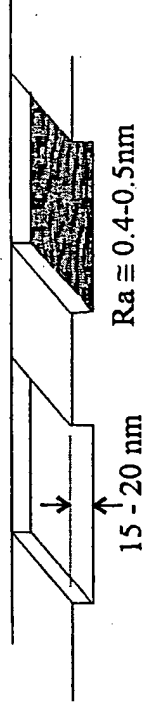
1. Pattern Writer, 257 nm UV



2. After Resist Removal

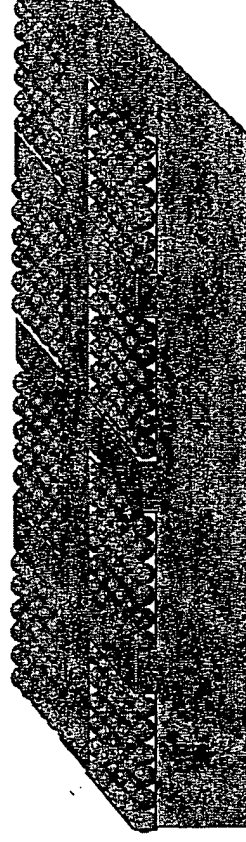


3. RIE: Shallow Locking Pattern



glass ceramic, Si, ...

4. Planarization
with Nanoparticles



(D. Weller, N. Deeman, Th. Valet, N. Shukla, R. van de Veerdonk)

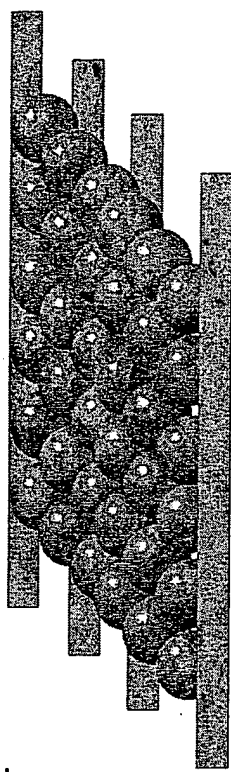
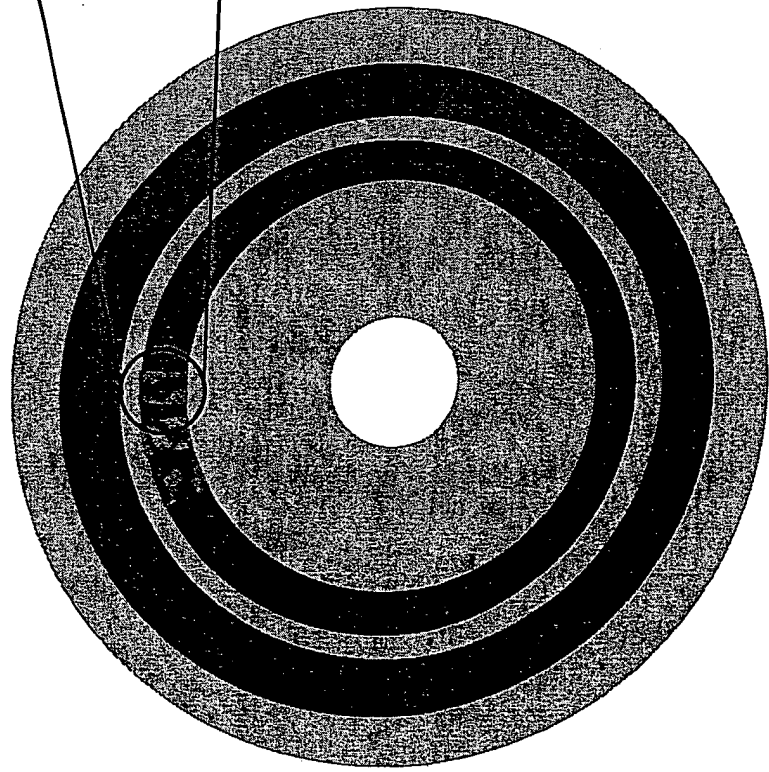
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Disk Architecture / Density Potential



Use Locking pattern as Servo Pattern
Scalable Density --> 1 Particle per Bit



Thermal Limit: 20 - 100 Tbit/in²